

An abstract graphic composed of several rectangular blocks in shades of blue and orange. The blocks are arranged to form a large, stylized cross or plus sign. The central vertical bar is a solid blue rectangle. The horizontal bar is composed of several blue blocks of varying heights and widths, with one orange block positioned in the center of the horizontal bar. The text "National Center for Real Estate Research" is overlaid on this graphic in a bold, blue, sans-serif font.

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THE VALUE OF HOUSING CHARACTERISTICS: A META ANALYSIS

by

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Executive Summary

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Although the market generally agrees that house prices reflect the value of individual housing characteristics, there is no consensus as to how some characteristics affect value. Researchers have examined numerous data sets and hedonic pricing models to determine the marginal effect of characteristics on house prices. Historically, hedonic pricing results have been considered to be model specific, especially regarding location and time. This study should help to answer the question of whether hedonic results are unique or whether results are more universal than traditionally believed. While researchers often focus on the theoretical relationship between house prices and housing characteristics, empirical evidence of the effects of these characteristics is of considerable interest to practitioners such as real estate brokers, developers, and appraisers.

To examine the results of hedonic pricing models, this study uses meta analysis. Meta analysis is the quantitative analysis of a body of studies and provides a more comprehensive framework for reviewing the literature by providing statistical evidence of the overall impact of one variable on another. Meta analysis has its foundation in medical, psychological, and educational research; however, there is also an emerging

body of literature using meta analysis in economics, examining primarily the labor market and wage rates.

Meta regression analysis is superior to a simple narrative in that it allows a quantifiable assessment of empirical studies. It can be used to identify sources of variation across estimated regression coefficients on a given variable of interest. In meta regression the estimated coefficient becomes the dependent variable and the coefficient from each study is an observation. The meta regression model expresses the functional relationship between the regression coefficients and a set of moderator (explanatory) variables that describe important model and data characteristics.

This study uses meta regression analysis (MRA) to evaluate the relationship between house price and nine housing characteristics: (1) square footage, (2) lot size, (3) age, (4) bedrooms, (5) bathrooms, (6) garage, (7) swimming pool, (8) fireplace, and (9) air conditioning. The regression coefficients for these variables that are produced in hedonic pricing models are examined for differences across a set of moderator variables. Primary questions of interest are: Is a characteristic's estimated coefficient in a hedonic pricing model a function of geographical location, the source of the data used in the study, or the time period of the data?

A meta regression for each of the above nine variables is estimated against these moderator variables:

- (1) Geographical location in the U. S. segmented into the following regions: Northeast, Southeast, Southwest, Midwest, and West. The objective is to determine whether the housing characteristic's hedonic pricing model estimated coefficient varies by location;

- (2) The time period of the data. This is designed to determine whether the effect of the housing characteristic on house price has changed over time. Time is measured by a time trend variable representing years from 1976 through 2003;
- (3) The median household income for the study's data year and location. This measures whether the value of the household characteristic varies by the area's level of income. Income is measured as the median household income for the data area for a given study;
- (4) The type of data used to estimate the hedonic pricing model. The purpose is to determine whether the characteristic's regression coefficient varies by the type of data used in the analysis. Type of data is measured as Multiple Listing Service (MLS), Assessor, or American (formerly Annual) Housing Survey (AHS);
- (5) Control variables in the hedonic pricing models. These are binary variables indicating that a study has controlled for certain other variables. This is designed to measure whether controlling for other variables in the hedonic model affects the estimated coefficient of the characteristic;
- (6) The specification of the model measured as the number of variables included in the hedonic model. This is to help determine whether a more inclusive model affects the estimated coefficient of the housing characteristic.

Meta regressions are estimated for each of the nine housing characteristics stated above. These are the characteristics that have appeared most often in hedonic pricing models. Conclusions for the individual housing characteristics are:

- The square footage coefficient differs by some geographical locations but not by time, household income, or source of data;

- The lot size coefficient differs across some geographical locations and controlling for square footage lowers the lot size coefficient. Lot size is not affected by time, income, or the type of data;
- The age coefficient is affected by geographical location, time and type of data but not by income;
- The bedrooms coefficient is sensitive to some geographical locations but not to time, income, or type of data. Controlling for square footage lowers the effect of bedrooms on house price;
- The coefficient for bathrooms is sensitive to some geographical locations and type of data but is not affected by time or income;
- The garage coefficient differs by some geographical locations but not by time, income, or type of data;
- The swimming pool coefficient is sensitive to some geographical locations but is not affected by time, income, or type of data;
- The fireplace coefficient is affected by type of data but not by geographical location, time, or income; and
- The air conditioning coefficient is affected by some geographical locations but not by time or type of data. Household income does have a negative effect on the air conditioning coefficient.

This study examines the effect of several moderator variables on the estimated coefficients of the nine housing characteristics. The moderator variables of primary interest are geographical location, time, and type of data. Some conclusions are:

- Most of the characteristics had at least some variation by location. Controlling for geographical location produced differences in coefficients for square footage, lot size, age, bedrooms, bathrooms, swimming pool, garage, and air conditioning but not for fireplace;

- The effects on house price of most of the housing characteristics have not changed over time. Only the age coefficient was affected by time and the effect is negative;
- Controlling for the type of data (MLS, Assessor, AHS) produced differences in coefficients for age, bathrooms, and fireplace;
- The coefficient for air conditioning was the only characteristic affected by the level of household income and the effect was negative;
- Controlling for square footage produced lower coefficients for lot size and bedrooms; and
- Controlling for the size of the hedonic model did not affect the coefficients for any of the characteristics.

Overall, these results provide important information regarding the effect of these characteristics on house prices and the interpretation of hedonic pricing model results. Historically, hedonic pricing model results have been considered to be specific to the model, especially regarding location and time. The results of the meta regression models show that hedonic estimates do experience some significant variation but perhaps not as much as traditionally believed.

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Topics of primary interest include, but are not limited to:

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- Housing policy
- Housing markets
- Real estate wealth effect
- New economy / technology
- Cost and impact of regulation
- Land use controls
- Multifamily
- Retail
- Office
- Industrial
- Commercial property finance

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